REPORT DOCUMENTATION PAGE			Form Approved OMB No. 0704-0188
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection			
1. AGENCY USE ONLY *(Leave blank)*	2. REPORT DATE 30 Dec 01	3. REPORT TYPE AND DATES COVERED Final Technical Report 01 Jun 00 – 30 Sept 01	
4. TITLE AND SUBTITLE Challenges of Virtual Teams: The Complex Effects of Personality and Turnover on Trust, Collective Efficacy, Performance, and Member Retention.			5. FUNDING NUMBERS N00014-00-10769
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9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Office of Naval Research 800 N. Quincy St. Arlington, VA 22217-5660 www/onr.navy.mil			10. SPONSORING/MONITORING AGENCY REPORT NUMBER
11. SUPPLEMENTARY NOTES			
12a. DISTRIBUTION/AVAILABILITY STATEMENT Distribution Unlimited			20020103 091

13. ABSTRACT *(Maximum 200 words)* Both academics and practitioners have suggested that virtual teams (VTs) allow organizations to address the challenges of increasingly complex and dynamic environments. VTs often encounter unexpected coordination and management problems. The purpose of this study is to investigate the coordination challenges that group turnover, virtual communication, and certain group member personality traits present for the development of functional group structures and processes. The experimental study investigated the effects of group personality characteristics, available communication mode, and group turnover on perceived group characteristics, intention to leave, and group performance. The groups participated in a complex, multi-round management simulation in a factorial design (2x2), manipulating: (1) the available mode for group communication (virtual vs. face-to-face communication) and (2) group turnover (turnover vs. no turnover). Preliminary conclusions indicated that turnover in the team results in a disruption or process loss of communication for virtual teams while information exchange across teams occurs in face-to-face teams. Members of the face-to-face teams perceived a higher level of group efficacy than did virtual team members. It was speculated that a new team member provides the group with information on how well other groups are doing and facilitates a richer information exchange among face-to-face team members.

14. SUBJECT TERMS			15. NUMBER OF PAGES 5
Teams, Virtual Teams, Personality, Turnover, Trust, Collective Efficacy, Team Performance,			16. PRICE CODE
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT

FINAL TECHNICAL REPORT

GRANT #: N00014-00-10769

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GRANT TITLE: Challenges of Virtual Teams: The Complex Effects of Personality and Turnover on Trust, Collective Efficacy, Performance and Member Retention

AWARD PERIOD: 1 June 2000 – 30 Sept 2001

OBJECTIVE:

Both academics and practitioners have suggested that virtual teams (VTs) allow organizations to address the challenges of increasingly complex and dynamic organizational environments. However, VTs often do not lead to the expected performance improvements, but encounter unexpected coordination and management problems. Research has only started to provide evidence of the precise nature of differences between VTs and traditional, face-to-face teams. In an attempt to provide insight into the critical success factors for virtual, loosely coupled teams, we intended to accomplish the following objectives.

1. To investigate the substantial coordination challenges that group turnover, virtual communication, and certain group member personality traits present for the development of functional group structures and processes (e.g., group efficacy, group trust, communication norms).

2. To investigate how individual team members' perceptions of group structures and processes are affected by turnover, virtual communication, and personality traits. .

3. To investigate the potential moderating effects between personality characteristics, propensity to trust, group efficacy, and satisfaction of group members.

4. To investigate the effect of all of these factors on team performance.

5. To develop the necessary methodology to test similar hypotheses in other settings in future studies (e.g., using actual managers or military teams),

APPROACH

Overview: The experimental study investigated the effects of group personality characteristics, available communication mode, and group turnover on perceived group characteristics, intention to leave, and group performance. Student subjects were randomly assigned to three-member decision-making groups. These groups participated in a complex, multi-round management simulation in a factorial design (2 x 2) manipulating: (1) the available mode for group communication (virtual vs. /face-to-face communication), and (2) group turnover (turnover vs. no turnover). The groups received monetary rewards based on the group performance. Individual and group characteristics were captured by the computer simulation software and by questionnaires at several points in time during the experiment (e.g., NEO Personality Inventory Revised (NEO-PI-R; Costa & McCrae, 1992).

Task: The task in which the groups participated was a team training simulation developed at the Naval Systems Training Center in Orlando, Florida. The Tactical Navy Decision Making System (TANDEM) is a simulated radar display that spots a predetermined number of "targets" on the screen. The task, in essence, is to determine the type and intent of the target, and take appropriate action. The simulation program allows the experimenters to structure the task to be performed by either individuals or teams of three members. The information needed to make appropriate identification and decisions can be manipulated, as can the distribution of that information. Thus, under a team configuration, levels of interdependence and interpersonal contact can be controlled in an experimental context. Numerous performance measures can be collected, including how often and how long each target was "hooked" (i.e., observed) as well as correct/incorrect identification, action choices, total scores, and others.

Research Design and Procedure: See Appendix A for the Experimental Design. The TANDEM, a realistic Navy radar simulation, was installed on the server in the Experimental Laboratory in the School of Business Administration at the University of Mississippi. In the simulation, participants are members of a three-member crew on a ship, and their goal is to identify and label as many contacts as possible. The teams spent 25 minutes on the first questionnaire and then had 20 minutes of training on TANDEM. After participating in the simulation for 15 minutes, the turnover treatment was applied at that point to the appropriate groups. Each group member then spent 15 minutes on an intermediate questionnaire before participating in the second round of the TANDEM simulation. Finally, the post-experimental questionnaire was administered, which took approximately 20 minutes. The group performance score was the score that the team received on the 2nd round of the simulation. Participants were designated as either Alpha,

Bravo, or Charlie and performed different functions on the radar screen. Each team member had a subtask, with dummy controls at the individual. Controls were also instituted for prior performance of the group. If the team did well in the first simulation, we controlled for it. During each simulation, the subjects received the same feedback on their performance. At the end of the simulation, they received a score.

ACCOMPLISHMENTS (throughout award period):

Early in the award period, co-investigators reviewed the theoretical background in group dynamics, personality, coordination, the propensity to trust, and turnover effects. Teamwork was the primary focus, and related hypotheses were developed.

A graduate assistant was secured to work on the project for the 2000-2001 academic years. Jimmy Hinton is 50 years old and is pursuing a Ph.D. in Management. The support he received from this project was critical to his remaining in school. He was introduced to the simulation, extended the literature, participated in the set-up of the experiment, and scheduled the student subjects.

The TANDEM simulation was installed on the server in the Experimental Laboratory in the School of Business Administration. Initially, IT personnel encountered problems related to connecting and collecting data from several teams simultaneously, and we were only able to run the simulation with a single team at one time. Work continued to enable the server to handle several teams at one time. Fortunately, with additional hardware and manpower, we were able to network the computers so that three 3-person teams could participate in the simulation simultaneously. Methods developed during the award period will ensure that the simulation and Experimental Laboratory can be used for future projects that are team-oriented.

We completed the data collection for the pilot study in the third quarter of the award period. After refining procedures, we completed the main study in April 2001. We had 32 three-person teams for a total of 96 subjects. Data were coded and a preliminary analysis was conducted on the treatment variables.

Data Analysis: A data set for the group level variables was created as well as one for the individual level variables. Using regression analyses on the group level variables for our experimental treatments (Virtual Teams vs. Face-to-Face Teams and Turnover vs. No Turnover), we found that virtual communication has a strong negative effect on group performance and group efficacy. In other words, communication in virtual teams actually reduces group performance and group efficacy. There was no significant effect of turnover at the group level and no significant interaction effect of turnover and virtual communication.

At the individual level, we found significant results of our treatments on individual perceived group efficacy, the dependent variable. Several findings were interesting and

somewhat counterintuitive. First, face-to-face team members perceived a higher level of group efficacy than did virtual team members. This is not surprising given that the communication is more tedious among virtual team members, but it seems that virtual team members do not believe that they can perform as well. Second, turnover had a negative effect on the individual perceived group efficacy in virtual teams. At the same time, however, turnover had a positive effect on the individually perceived group efficacy in face-to-face teams. The negative effect in virtual teams is not surprising as we expected turnover to disrupt the established group processes and to encourage frustration in adjusting to new group members. The positive effect in face-to-face teams is somewhat surprising, as the aforementioned disruption hypothesis would suggest the opposite. An explanation seems to be that turnover, in general, did not have the expected negative effect on group performance or group efficacy or individual perceived group efficacy. With regard to the positive effects of turnover, it may be that the information a new group member gains and provides on how well other groups are doing (outside benchmark and uncertainty reduction) and the redundant communication in face-to-face groups may facilitate communication of such information. It is important to note that the sample size is small (32 teams). We need to look in more detail to better understand the findings.

Additional experimental sessions were conducted during fall 2001 to increase the sample size and to give us more confidence in interpreting the results. Currently, this additional data is being analyzed along with the personality and trust data. With regard to the personality variable, the configuration of the team may affect trust, and the raw personality data needs to be aggregated based on weighting.

CONCLUSIONS:

Preliminary conclusions indicated that turnover in the team results in a disruption or process loss of communication for virtual teams. The process loss hypothesis is the idea that communication becomes less rich through the computer since not as many social cues are transmitted. It seems that turnover in the team results in information exchange across teams for face-to-face teams. When there is a turnover situation in face-to-face teams, information exchange about the struggling of other teams or of what has worked at other teams may be facilitated by the richer information exchange in face-to-face communication. In virtual teams, communication becomes less rich.

The above conclusions are based on a small sample size. Coupling these data with the data collected during fall 2001 to increase the sample size will enable us to make statements with more confidence. We plan to compare the effect of group efficacy on other variables such as group satisfaction and group trust to perhaps understand what is driving this increase in efficacy. In addition, we want to examine the sub-dimensions related to group efficacy with our data on perceived member motivation.

SIGNIFICANCE:

Scientifically, the research will contribute to the increasing volume of literature on virtual teams and flexible networks in the fields of organizational behavior and organizational theory. It extends current research on personality traits in the psychology and organization behavior literature to the virtual team setting. The methodology will be used in future studies to test similar hypotheses in other settings such as in managerial teams and military teams.

Militarily, this project has provided information that may contribute to the military's ability to accomplish its recruiting and retention objectives. A better understanding of the complex impact of personality characteristics, team communication mode, team turnover, and perceptions of core team characteristics on team performance and team members' intentions to leave will provide a starting point for improving the military's group management practices. Such research may enable the military to add more dependability to its selection, training, and assignment of team members, especially with regard to virtual teams.

The research has the potential to identify management practices that will result in more effective teams and improve team performance. Furthermore, the research may provide evidence of managerial skills that can impact retention of team members and mitigate the potential negative effects of team turnover.

BOOK CHAPTERS, SUBMISSIONS, ABSTRACTS AND OTHER PUBLICATIONS (for total award period)

Work in Progress

Appendix A

Virtual Teams
Laboratory Experiment

Treatment Conditions

No Turnover				Turnover			
Face to Face		**Virtual Team**		**Face to Face**		**Virtual Team**	
Timing		**Timing**		**Timing**		**Timing**	
25 min	Pre-Questionnaire - Expected satisfaction - Expected effectiveness - Propensity to trust - Future collaboration - Individual motivation - Neo-PI	25 min		25 min	Pre-Questionnaire - Expected satisfaction - Expected effectiveness - Propensity to trust - Future collaboration - Individual motivation - Neo-PI	25 min	
20 min	Simulation Training	20 min		20 min	Simulation Training	20 min	
15 min	Simulation #1	15 min		15 min	Simulation #1	15 min	
					TURNOVER		
15 min	Intermediate Questionnaire: - Team Trust - Psychological Contract - Team Efficacy - Satisfaction - Team Effectiveness	15 min		15 min	Intermediate Questionnaire: - Team Trust - Psychological Contract - Team Efficacy - Satisfaction - Team Effectiveness	15 min	
15 min	Simulation #2	15 min		15 min	Simulation #2	15 min	
20 min	Post-Experimental Questionnaire: - Team Trust - Psychological Contract - Group Efficacy - Group Processes - Satisfaction - Team Effectiveness - Biographic Information - Group Diversity	20 min		20 min	Post-Experimental Questionnaire: - Team Trust - Psychological Contract - Group Efficacy - Group Processes - Satisfaction - Team Effectiveness - Biographic Information - Group Diversity	20 min	